REMARKS

In response to the Office Action mailed February 23, 2004, Applicant respectfully requests reconsideration. Claims 1-32 are pending in this application. To further the prosecution of this application, each of the rejections set forth in the Office Action is addressed below and the application as presented is believed to be in condition for allowance.

The Office Action rejected claims 1-32 under 35 U.S.C. §102(e) as purportedly being anticipated by Cabrera (6,119,131). Applicant respectfully traverses this rejection.

Discussion of Cabrera

Cabrera teaches that most operating systems associate a logical unit of mass storage with a device name and a user-friendly name, such as a drive letter, so that the data on the storage device is easily accessible to the higher layers of the operating system, as well as user applications (Col. 1, lines 19-24). The higher layers of the operating system and user applications assume that the user-friendly names are persistent across boot sessions, while in actuality, these names are persistent only as long as the physical configuration remains unchanged (Col. 1, lines 24-28). Persistence cannot be guaranteed because operating systems typically assign the user-friendly names in the order in which the storage devices are detected when booting (Col. 1, lines 29-30). If the physical locations of the storage devices change, the operating system will assign the user-friendly names to different devices (Col. 1, lines 31-33).

Cabrera further discloses that file systems are typically arranged in a hierarchical tree structure referred to as a namespace (Col. 1, lines 46-46). Logical volumes, directories, and files in the namespace are assigned user-friendly names. As discussed above, these user friendly names are usually assigned based on the order in which storage devices are detected during booting, and thus are not guaranteed to be persistent. Higher layers of the operating system and user applications may specify a path through the namespace to the location of data in the hierarchy (Col. 1, lines 48-53). The global namespace of a computer system may encompass multiple logical volumes (Col. 1, lines 55-56). The hierarchical structure is created by using a volume mount point in one logical volume to graft the local namespace of the logical volume to the local namespace of another logical volume, so that the logical volumes will be hierarchically arranged in the global namespace (Col. 1, lines 59-62). However, because the user-friendly

names are not guaranteed to be persistent, the consistency of the volume mount points cannot be guaranteed across boot sessions (Col. 1, lines 62-65).

Cabrera is directed to solving this problem by providing persistent user-friendly names for logical volumes and guaranteeing the consistency of volume mount points despite physical configuration changes in the underlying storage medium (Col. 1, line 66 – Col. 2, line 3). To accomplish this, Cabrera discloses a computer 200 in Figure 2A that includes a mount manager 201 and a persistent mount manager data structure 203, responsible for associating user-friendly names, used by the higher layers of the operating system and user applications, with mounted logical storage volumes, so that the underlying physical devices can be accessed using the user-friendly names (Col. 6, lines 57-65). The operating system of computer 200 creates a number of logical volumes 205-208 associated with physical media devices, such as a hard disk drive (Col. 7, lines 7-9). Each logical volume is identified by a unique volume identifier 223, which is stored on the physical device(s) that stores the particular logical volume (Col. 7, lines 9-10). Cabrera discloses that the unique volume identifier 223 is guaranteed to be unique on the particular computer (Col. 7, lines 11-12). Cabrera does not disclose or suggest that the unique volume identifier is unique with respect to other computers.

In addition to having user-friendly names, each logical volume is assigned a mount name, which includes a globally unique identifier (GUID) that is generated by the operating system (Col. 7, lines 45-49). The unique volume identifier 223 is associated with the user-friendly name of the logical volume, as well as a mount name in the mount manager data structure (Col. 7, lines 34-37). The mount manager informs the operating system of the associations between the user-friendly names and the unique volume identifier, as well as the associations between the mount names and the unique volume identifier, thereby maintaining persistence of the mount names and the user-friendly names over boot sessions (Col. 7, line 51-Col. 8, line 10).

Additionally, the mount names are used to mount logical volumes to the volume mount points of other logical volumes. Because the mount name of a logical volume is globally unique, only the correct target logical volume can be mounted at a volume mount point (Col. 8, lines 20-47). This permits the hierarchical structure of the global namespace to be maintained if the global namespace is mounted in another computer (Col. 8, line 63 – Col. 9, line 1). Such a situation may arise in a failover computer cluster when one of the clustered computers fails and

its global namespace is grafted onto the global namespace of one of the other computers in the cluster (Col. 9, lines 1-5). In this situation, the user-friendly names, unique volume identifiers, and device names for the logical volumes change, but the globally unique mount names serve to uniquely identify the logical volumes despite such changes (Col. 9, lines 18-23).

Applicant's Claims Patentably Distinguish Over Cabrera

Initially, Applicant notes that Cabrera discloses two types of unique identifiers: a unique volume identifier and a mount name which includes a globally unique identifier (GUID). The unique volume identifier is discussed at col. 7, lines 9-12 of Cabrera, where Cabrera discloses that a unique volume identifier identifies a logical volume and is guaranteed to be unique only on the particular computer on which the logical volume is stored. As the unique volume identifier is only unique within one computer, the unique volume identifier is not an enterprise logical volume identifier (ELVID), as recited in Applicant's claims.

The mount name identifier is discussed at column 7, lines 45-50, where Cabrera discloses that the mount name includes a GUID, which is unique across multiple computers. Without conceding that the claimed ELVID reads on the mount names (including a GUID) of Cabrera, even if one were to read the claimed ELVID on the mount name of Cabrera, Applicant's claims still patentably distinguish for the reasons discussed below.

Claim 1

Claim 1 is directed to a method of accessing one of a plurality of logical volumes stored on a plurality of storage systems in an enterprise, the one of the plurality of logical volumes being stored on at least one of the storage systems. The method comprises steps of: specifying an enterprise logical volume identifier (ELVID) for the one of the plurality of logical volumes that uniquely identifies the one of the plurality of logical volumes among the plurality of logical volumes, so that the ELVID can be used to access the one of the plurality of logical volumes on at least two of the plurality of storage systems; specifying a physical storage address for the one of the plurality of logical volumes; and verifying that the ELVID corresponds to the physical storage address.

Cabrera fails to disclose or suggest "verifying that the ELVID corresponds to the physical storage address," as recited in claim 1, as Cabrera does not disclose or suggest verifying that the mount names (i.e., mount names 213 in Figure 2A), which include globally unique identifiers (GUIDs), correspond to physical storage addresses. The Office Action asserts that Cabrera discloses this limitation at column 8, lines 2-10 and column 9, lines 34-58. Applicant respectfully disagrees.

At column 8, lines 2-10, Cabrera discloses that maintaining a persistent mount manager data structure 203 that maps both the mount names and the user-friendly names to their corresponding unique logical volume identifiers allows for consistency between the mount names and/or user-friendly names (e.g., drive letters) across boot sessions, regardless of the underlying physical configuration of the computer. This portion of Cabrera does not disclose "verifying that the ELVID corresponds to the physical storage address," but simply discloses that a persistent data structure is stored that maps mount names to corresponding logical volumes. Storing a data structure that includes such a map is very different from verifying that an ELVID corresponds to a specified physical storage address (e.g., by verifying that the data in the map is accurate).

The cited portion of Cabrera at column 9, lines 34-58 relates to temporarily moving a logical volume from a first computer to a second computer in response to, for example, failure of the first computer. Cabrera discloses that when a logical volume is temporarily removed from a computer, the mount manager breaks the symbolic links between device names and redirected names (i.e., mount names), but does not remove the corresponding entries from the map in the persistent data structure (Col. 9, lines 34-36). If a device is removed and reintroduced in the same boot session, the device will have a different device name when it is reintroduced, because a device name is used only once during a boot session (Col. 9, lines 36-38). The mount manager, however, can recognize the logical volumes on the device based on the unique volume identifier and find the corresponding mount name in the map in the persistent data structure. (Col. 9, lines 38-40) The mount manager may then instruct the operating system to form a symbolic link between the device name and the corresponding mount name (Col. 9, lines 41-43). Cabrera discloses that this guarantees that symbolic links will always resolve to the correct logical volume both during a boot session and across multiple boot sessions (Col. 9, lines 44-48).

This portion of Cabrera does not disclose or suggest verifying that a mount name, which includes a GUID, corresponds to any physical storage address. The cited portion merely discloses forming a symbolic link between a device name and a mount name to replace a symbolic link that has been previously deleted. Creating such a link is different from verifying that a correspondence between a mount name and a physical storage address is correct. Such a verification is not disclosed or suggested by Cabrera.

While Applicant's claims are not limited to this specific implementation, as described in Applicant's specification at page 38, line 24 – page 39, line 24, a host may verify that an ELVID corresponds to a physical storage address by sending an access request for a logical entity using the physical address for the logical entity. The host may also add the corresponding ELVID into the access request. The physical address and the ELVID may be matched to assure that the host is accessing the correct data. The step of matching may be performed, for example, by an enterprise storage management console or a primary storage element. Thus, both the physical storage address and the ELVID for a logical entity may be specified and a verification step may be performed to ensure that the host is accessing the correct logical entity.

Cabrera does not disclose performing a verification step that compares mount names to logical volume identifiers to ensure that the correct data is being accessed. Access requests in Cabrera do not specify both mount names and logical volume identifiers and the data structure that maps mount names to logical volume identifiers is used only to ensure the persistence of mount names across boot sessions of the computer. This data structure is not used to verify that a specified mount name and logical volume match.

Thus, as Cabrera fails to disclose or suggest, "verifying that the ELVID corresponds to the physical storage address," claim 1 patentably distinguishes over Cabrera. Accordingly, it is respectfully requested that the rejection of claim 1 under 35 U.S.C. §102(e) be withdrawn.

Claims 2-14 depend from claim 1 and are patentable for at least the same reasons. Accordingly, it is respectfully requested that the rejection of claims 2-14 under 35 U.S.C. §102(e) be withdrawn.

Claim 15

Claim 15 is directed to a method of accessing one of a plurality of logical volumes stored on a plurality of storage systems in an enterprise, the one of the plurality of logical volumes being stored on at least one of the storage systems. The method comprises steps of: specifying an enterprise logical volume identifier (ELVID) for the one of the plurality of logical volumes; specifying a physical storage address for the one of the plurality of logical volumes; and using the ELVID to assure that an entity requesting access to the one of the plurality of logical volumes is authorized to do so, the ELVID uniquely identifying the one of the plurality of logical volumes among the plurality of logical volumes and being usable to access the one of the plurality of logical volumes on at least two of the plurality of storage systems.

Cabrera fails to disclose or suggest "using the ELVID to assure that an entity requesting access to the one of the plurality of logical volumes is authorized to do so," as recited in claim 15. The Office Action asserts that Cabrera discloses this limitation at column 2, lines 10-59, column 7, lines 1-22, and column 6, lines 38-67. Applicant respectfully disagrees with this assertion.

Cabrera does not discuss controlling access to logical volumes and is completely unrelated to assuring that entities requesting access to a volume are authorized to do so. It is unclear why the Examiner believes the cited portions of Cabrera are relevant, as these portions do not discuss access control or authorization. If the rejection is to be maintained, clarification is respectfully requested.

At column 2, lines 10-59, Cabrera discloses maintaining persistent mount names, but does not disclose controlling access to logical volumes. At column 7, lines 1-22, Cabrera discusses in greater detail how persistent mount names are maintained across boot sessions, but likewise does not mention controlling access to volumes. At column 6, lines 38-67, Cabrera discusses the persistent data structure that may be used to store a map of logical volume identifiers and mount names. Again, there is no discussion of assuring authorized access.

Because Cabrera does not disclose "using the ELVID to assure that an entity requesting access to the one of the plurality of logical volumes is authorized to do so," as recited in claim 15, claim 15 patentably distinguishes over Cabrera. Accordingly, it is respectfully requested that the rejection of claim 15 under 35 U.S.C. §102(e) be withdrawn.

Claims 16-25 depend from claim 15 and are patentable for at least the same reasons. Accordingly, it is respectfully requested that the rejection of claims 16-25 under 35 U.S.C. §102(e) be withdrawn.

Claim 26

Claim 26 is directed to a host computer, comprising: a processing unit; and an enterprise logical volume identifier (ELVID) interface module to transmit an access request for at least one of a plurality of logical volumes, the access request including an ELVID for the at least one of the plurality of logical volumes and a respective physical storage location on one of a plurality of storage systems, the ELVID uniquely identifying the one of the plurality of logical volumes among the plurality of logical volumes and being usable to access the one of the plurality of logical volumes on at least two of the plurality of storage systems.

Cabrera fails to disclose or suggest an "ELVID interface module to transmit an access request for at least one of a plurality of logical volumes, the access request including an ELVID for the at least one of the plurality of logical volumes and a respective physical storage location on one of a plurality of storage systems," as recited in claim 26.

First, Cabrera fails to disclose a host computer that sends access requests to one of a plurality of storage systems, the access request including an ELVID usable to access a volume on at least two storage systems. In the system of Cabrera, all accesses to logical volumes are performed within a single computer. Thus, there is no ELVID interface module in Cabrera.

Second, the access requests in Cabrera do not include an ELVID and a physical storage location. Cabrera discloses that files are accessed using user-friendly names (*see* Col. 6, lines 1-10), not by specifying a physical storage location of the file. Indeed, Cabrera is directed to ensuring that user-friendly names correspond to the correct logical volumes across boot sessions. Files in Cabrera are not accessed using both a user-friendly name (including a GUID) and a physical storage location. Files are accessed merely by specifying the user-friendly name.

Thus, Cabrera fails to disclose or suggest an ELVID interface module to transmit an access request, "including an ELVID for the at least one of the plurality of logical volumes and a respective physical storage location on one of a plurality of storage systems," as recited in claim

26. Accordingly, it is respectfully requested that the rejection of claim 26 under 35 U.S.C. §102(e) be withdrawn.

Claim 27

Claim 27 is directed to a storage system for use in an enterprise comprising a plurality of storage systems coupled by a network, the plurality of storage systems to store a plurality of logical volumes. The storage system comprises: a storage medium to store data corresponding to the plurality of logical volumes; and an enterprise logical volume identifier (ELVID) verifier module to verify that an access request to a physical storage location on the storage medium is directed to a correct one of the plurality of logical volumes as identified by an ELVID, the ELVID uniquely identifying the correct one of the plurality of logical volumes among the plurality of logical volumes and being usable to access the correct one of the plurality of logical volumes on at least two of the plurality of storage systems.

As should be clear from the discussion above, Cabrera fails to disclose or suggest, "an enterprise logical volume identifier (ELVID) verifier module to verify that an access request to a physical storage location on the storage medium is directed to a correct one of the plurality of logical volumes as identified by an ELVID," as recited in claim 27. Thus, claim 27 patentably distinguishes over Cabrera. Accordingly, it is respectfully requested that the rejection of claim 27 under 35 U.S.C. §102(e) be withdrawn.

Claim 28 depends from claim 27 and is patentable for at least the same reasons. Accordingly, it is respectfully requested that the rejection of claim 28 under 35 U.S.C. §102(e) be withdrawn.

Claim 29

Claim 29 is directed to a storage system for use in an enterprise comprising a plurality of storage systems coupled by a network, the plurality of storage systems to store a plurality of logical volumes. The storage system comprises: a storage medium to store data corresponding to the plurality of logical volumes; and an enterprise logical volume identifier (ELVID) authorization module to verify that an access request to a physical storage location on the storage medium is received from an entity permitted to access one of the plurality of logical volumes

with a corresponding ELVID, the ELVID uniquely identifying the one of the plurality of logical volumes among the plurality of logical volumes and being usable to access the one of the plurality of logical volumes on at least two of the plurality of storage systems.

As should be clear from the discussion above, Cabrera fails to disclose or suggest, "an enterprise logical volume identifier (ELVID) authorization module to verify that an access request to a physical storage location on the storage medium is received from an entity permitted to access one of the plurality of logical volumes with a corresponding ELVID," as recited in claim 29. Accordingly, it is respectfully requested that the rejection of claim 29 under 35 U.S.C. §102(e) be withdrawn.

Claim 30 depends from claim 29 and is patentable for at least the same reasons. Accordingly, it is respectfully requested that the rejection of claim 30 under 35 U.S.C. §102(e) be withdrawn.

Claim 31

Claim 31 is directed to a computer system comprising: at least one host computer; a plurality of storage systems that store a plurality of logical volumes; and means for associating enterprise logical volume identifiers (ELVIDs) with requests for access to the plurality of logical volumes; and means for verifying that access requests to physical storage locations are made to an appropriate one of the plurality of logical volumes identified by a respective ELVID, the ELVID uniquely identifying the appropriate one of the plurality of logical volumes among the plurality of logical volumes and being usable to access the appropriate one of the plurality of logical volumes on at least two of the plurality of storage systems.

As should be clear from the discussion above, Cabrera fails to disclose or suggest, "means for verifying that access requests to physical storage locations are made to an appropriate one of the plurality of logical volumes identified by a respective ELVID," as recited in claim 31. Thus, claim 31 patentably distinguishes over Cabrera. Accordingly, it is respectfully requested that the rejection of claim 31 under 35 U.S.C. §102(e) be withdrawn.

Claim 32

Claim 32 is directed to a computer system comprising: at least one host computer; a plurality of storage systems that store a plurality of logical volumes; and means for verifying that access requests to the plurality of logical volumes using an associated enterprise logical volume identifier (ELVID) are made by an entity authorized to access a requested one of the plurality of logical volumes, the ELVID uniquely identifying the requested one of the plurality of logical volumes among the plurality of logical volumes and being usable to access the requested one of the plurality of logical volumes on at least two of the plurality of storage systems.

As should be clear from the discussion above, Cabrera fails to disclose or suggest, "means for verifying that access requests to the plurality of logical volumes using an associated enterprise logical volume identifier (ELVID) are made by an entity authorized to access a requested one of the plurality of logical volumes," as recited in claim 32. Accordingly, it is respectfully requested that the rejection of claim 32 under 35 U.S.C. §102(e) be withdrawn.

CONCLUSION

In view of the foregoing amendments and remarks, this application should now be in condition for allowance. A notice to this effect is respectfully requested. If the Examiner believes, after this request for reconsideration, that the application is not in condition for allowance, the Examiner is requested to call the Applicant's attorney at the telephone number listed below.

If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicant hereby requests any necessary extension of time. If there is a fee occasioned by this response, including an extension fee, that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 23/2825.

Respectfully submitted,
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